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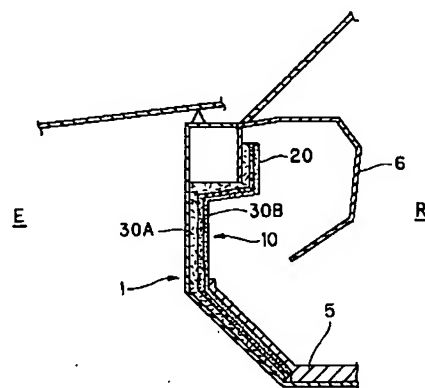
最終頁に続く

(54)【発明の名称】 車両用防音材

(57)【要約】

【課題】 車体パネルの室内面に取り付けられる車両用防音材であって、吸音性能を高めるとともに、軽量化を図り、燃費効率、取付作業性を高める。

【解決手段】 ダッシュパネル1の室内面に取り付けられるインシュレータダッシュ10は、発泡材表皮、フィルム材表皮、あるいは繊維集合体表皮からなる軽量の表皮層20と、多層の吸音層30A、30B、30Cとから構成され、吸音層30は、多孔質材料からなるベース吸音層30Aと、このベース吸音層30Aの片面、あるいは両面にベース吸音層30Aより面密度、バネ定数が小さく厚みの薄い補助吸音層30B、30Cを設けることにより、表皮層20のもつ膜吸音機能、共振機能を高めるとともに、ダッシュパネル1から透過する低周波数域の振動を有効に減衰する。



- 1 ダッシュパネル
- 5 フロアカーペット
- 6 インストルメントパネル
- 10 インシュレータダッシュ
- 20 表皮層
- 30 吸音層
- 30A ベース吸音層
- 30B 補助吸音層
- 30C 補助吸音層
- F 室内音
- F1 入射音
- F2 吸音材内部音
- F3 透過音
- F4 放射音
- F5 反射音

【特許請求の範囲】

【請求項1】 車体パネル(1)の室内面側に取り付けられる車両用防音材(10)であって、この防音材(10)は発泡材、フィルム材、あるいは繊維集合体からなる表皮層(20)と、発泡材、あるいは繊維集合体からなり、面密度、バネ定数及び厚みが異なる複数の吸音層(30)とから構成されていることを特徴とする車両用防音材。

【請求項2】 吸音層(30)は、ベース吸音層(30A)と、このベース吸音層(30A)と表皮層(20)との間に位置し、ベース吸音層(30A)より面密度、バネ定数が小さく薄肉の補助吸音層(30B)とから構成されていることを特徴とする請求項1に記載の車両用防音材。

【請求項3】 吸音層(30)は、ベース吸音層(30A)と、ベース吸音層(30A)と車体パネル(1)との間に位置し、上記ベース吸音層(30A)より面密度、バネ定数が小さく薄肉の補助吸音層(30C)とから構成されていることを特徴とする請求項1又は2に記載の車両用防音材。

【請求項4】 表皮層(20)は、非通気状態から高い通気性を備えた状態まで選択でき、膜振動による低・中周波数域の吸音機能と、多孔質の中・高周波数域の吸音機能を備えたことを特徴とする請求項1乃至3のいずれかに記載の車両用防音材。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、車体パネルの室内面側に取り付けられる車両用防音材に係り、特に、重量の嵩む遮音層を廃止して、軽量化を図るとともに、優れた吸音性能が得られる車両用防音材に関する。

【0002】

【従来の技術】通常、車室内の静粛性を高めるために、各種車両用防音材が設けられている。

【0003】図5、図6において、車両用防音材の一例として、インシュレータダッシュについて説明する。図5に示すように、エンジンルームEと車室Rとを区画するダッシュパネル1の室内面側にはインシュレータダッシュ2が添装されている。

【0004】このインシュレータダッシュ2は、図6に拡大して示すように、再生ゴムシート、再生塩ビシート等、高密度材料からなる遮音層3と、その裏面側に積層一体化される繊維集合体からなる吸音層4とから構成されている。

【0005】尚、インシュレータダッシュ2の下側表面には、フロアカーペット5がラップ状に敷設され、また、インシュレータダッシュ2の上部側はインストルメントパネル6内に位置している。

【0006】そして、従来の2層構造のインシュレータダッシュ2の防音メカニズムは、エンジンルームE内で

のエンジン類や捕器類の騒音は、ダッシュパネルで一部が遮音され、一部がダッシュパネル1を透過して室内側に伝播する。この伝播騒音は、更にその一部が吸音層4の多孔質吸音性により吸音されるとともに、遮音層3の二重壁遮音機能により遮音される。

【0007】

【発明が解決しようとする課題】このように、従来のインシュレータダッシュ2は、高密度材料を素材とした遮音層3と、繊維集合体からなる吸音層4との2層積層体から構成されており、特に、遮音層3の重量が非常に嵩むため、製品の軽量化に逆行し、燃費効率の低下やインシュレータダッシュ2の取付作業性を低下させるという問題点が指摘されている。

【0008】更に、従来のインシュレータダッシュ2の防音メカニズムは、インシュレータダッシュ2の主に二重壁遮音機能による遮音・吸音機能に依存しているため、インストルメントパネル6内での吸音機能が小さく、ターゲットとする騒音の周波数域が限定され、低周波数域から高周波数域における幅広い周波数域の騒音に対して必ずしも有効とはいえなかった。

【0009】この発明は、このような事情に鑑みてなされたもので、車体パネルの室内面側に取り付けられる車両用防音材であって、特に、重量が嵩む遮音層を廃止して、軽量化を促進させるとともに、低・中周波数域のレベルから中・高周波数域のレベルまで広い周波数域における騒音に対して優れた吸音性能が見込める車両用防音材を提供することを目的としている。

【0010】

【課題を解決するための手段】上記目的を達成するために、本願発明は、車体パネルの室内面側に取り付けられる車両用防音材であって、この防音材は発泡材、フィルム材、あるいは繊維集合体からなる表皮層と、発泡材、あるいは繊維集合体からなり、面密度、バネ定数及び厚みが異なる複数の吸音層とから構成されていることを特徴とする。

【0011】ここで、表皮層は、オレフィン系、EPDM等の物質からなり、材質は、ポリプロピレン、ポリウレタン、ポリエチレン、ポリエステル等の発泡材又はフィルム材からなる。又はフェルト、PET、紙類(パルプ等)を繊維状にした繊維集合体を使用することもできる。

【0012】この表皮層は面密度を特定するものではないが、好ましくは $0.005 \sim 0.3 \text{ kg/m}^2$ が良好である。厚みは $10 \mu\text{m} \sim 15 \text{ mm}$ であり、吸音層の全面、あるいは一部に設定することも可能であり、パネル側もしくは表面側又は両面に設定することもできる。

【0013】また、表皮層の材質として、発泡材、フィルム材を使用した場合、通気性が小さいか、あるいは非通気状態であれば、発泡材、あるいはフィルム材による膜振動が期待できるとともに、繊維集合体を使用した場

合、共振作用により低・中周波数域（500～2500 Hz）の騒音を有効に吸音できる。更に、表皮層として、発泡材、あるいは繊維集合体を使用して、通気性を比較的大きく設定すれば、多孔質による吸音機能が得られる。

【0014】次いで、吸音層の材質は、フェルト、PET、紙類（パルプ等）等を繊維状にした繊維集合体、又はオレフィン系、EPDM等の多孔質物質（発泡材）からなる。

【0015】更に、吸音層は、少なくとも2層以上の面密度、バネ定数及び厚みの異なる複数層から構成されることが条件である。ベース吸音層の面密度が0.2～3.0 kg/m²、ベース吸音層の厚みが2～200 mmである一方、ベース吸音層に対して厚みが薄くかつバネ定数が小さい補助吸音層については、面密度が0.5 kg/m²以下で、厚みは1～30 mmの範囲が良好である。

【0016】また、バネ定数の小さい補助吸音層は、ベース吸音層の表皮層側面、あるいはパネル側面のいずれか一方側、あるいは両面に設定することができる。更に、本発明に係る垂直入射吸音率の平均値は、630～4000 Hzの範囲で30～90%（厚み20 mm時）である。

【0017】そして、本願発明に係る車両用防音材によれば、表皮層として、従来の重量の嵩む遮音層を廃止して、繊維集合体、あるいは発泡材、フィルム材を使用しているため、製品の軽量化を促進することができる。また、表皮層を非通気状態、あるいは通気性を小さくすれば、表皮層の膜振動又は共振作用により、全域、特に低・中周波数域の騒音を有効に吸音することができる。

【0018】更に、表皮層の通気性を増加させることにより、中・高周波数域の騒音を多孔質吸音機能により吸音層とあいまって有効に吸音することができる。

【0019】加えて、吸音層は、複数の層から構成され、ベース吸音層に対して、それよりも厚みが薄く、面密度、バネ定数が小さい補助吸音層をベース吸音層の両面、あるいは片面に設けるという構成であるため、補助吸音層をベース吸音層と表皮層との間に設ければ、表皮層としての膜吸音機能、共振吸音機能をより向上させることができ、低・中周波数域の騒音をより有効に吸音できる。

【0020】更に、パネル面側にバネ定数の小さい補助吸音層を設定すれば、パネルからの低・中周波数域の振動を軽減させることができる。

【0021】

【発明の実施の形態】以下、本発明に係る車両用防音材の実施形態として、インシュレータダッシュに適用した具体例について、添付図面を参照しながら詳細に説明する。

【0022】図1は本発明に係る車両用防音材をインシ

ュレータダッシュに適用した第1実施形態を示す全体図、図2は同インシュレータダッシュの構成を示す概要図、図3、図4は本発明に係る車両用防音材をインシュレータダッシュに適用した第2実施形態、第3実施形態の積層構成を示す説明図である。

【0023】図1、図2を基に本発明の第1実施形態について説明する。図1において、エンジンルームEと車室Rとを区画するダッシュパネル1の室内面側にインシュレータダッシュ10が添装されており、インシュレータダッシュ10の下側表面には、フロアカーペット5がラップ状に敷設され、更に、インシュレータダッシュ10の上半部分は、インストルメントパネル6内に位置している。尚、インストルメントパネル6には、図示しないクラッシュパット等が装着されている。

【0024】ところで、本発明を適用したインシュレータダッシュ10は、燃費効率及び取付作業性を高めるために、製品重量を大幅に軽量化するとともに、軽量化しても十分な防音特性、特に、良好な吸音性能を維持するように構成されている。

【0025】すなわち、インシュレータダッシュ10は、軽量化した表皮層20と、吸音層30（ベースとなる多孔質材からなるベース吸音層30Aと、それらの両面、あるいは片面に積層される補助吸音層30B、30Cの複数層からなる）から構成されていることが特徴である。

【0026】そして、本発明の第1実施形態を適用したインシュレータダッシュ10は、表皮層20、補助吸音層30B、ベース吸音層30Aが製品表面側から順次積層されて構成されている。

【0027】更に詳しくは、表皮層20は、従来の重量の嵩む遮音層に替えて、軽量の素材を使用している。例えば、オレフィン系、EPDM等の物質からなり、その材質として、ポリプロピレン、ポリウレタン、ポリエチレン、ポリエステル等の発泡材、又はフィルム材を使用するか、あるいはフェルト、PET繊維、紙類（パルプ等）を繊維状にした繊維集合体を使用することもできる。面密度としては、特に数値を限定するものではないが、好ましい面密度の範囲として0.005～0.3 kg/m²が良好であり、厚みは最大15 mmとする。本実施形態のように、吸音層30の全面に設けても良いが、その一部のみに適用しても良く、また、吸音層30の両面に設定することも可能である。

【0028】次いで、吸音層30の材質は、フェルト、PET、紙類（パルプ等）を繊維状にした繊維集合体、又はオレフィン系、EPDM等の多孔性物質（発泡材）が使用でき、ベース吸音層30Aは、多孔質吸音機能を得るため、その面密度は0.2～3.0 kg/m²、厚みは2～200 mmの範囲に設定されている。

【0029】一方、ベース吸音層30Aに付設する補助吸音層30Bは、面密度、バネ定数がベース吸音層30

Aよりも小さく、面密度は、 0.5 kg/m^2 以下で、かつ厚みは1～30mmの範囲が適切である。

【0030】そして、図1、図2に示すインシュレータダッシュ10は、表皮層20として軽量素材を使用したため、製品重量を軽くでき、作業性、燃費効率の向上が可能になるとともに、特に、表皮層20の通気特性を種々変更することにより、所望の吸音性能を制御できる。

【0031】非通気状態、あるいは通気性が小さい場合では、表皮層20の膜振動、あるいは共振性により低・中周波数域(500～2500Hz)の騒音を有効に吸音できるとともに、表皮層20として通気性を備え、かつ通気性を増加させることにより、多孔質吸音機能が得られ、中・高周波数域(800～4000Hz)の騒音を有効に吸音できるなど、狙いの騒音の周波数域のチューニングが可能になる。従って、車により性能向上したい周波数が異なるため、その車の狙いとなる周波数に応じ、吸音特性を適宜変更することが可能となる。

【0032】更に、吸音層30として、ベース吸音層30Aと表皮層20との間に面密度、バネ定数が小さく、かつ薄肉の補助吸音層30Bを設けた2層構造の吸音層30とすることで、特に、表皮層20の膜吸音機能、あるいは共振吸音機能が有効に作用するため、表皮層20のもつ吸音性能をより高めることができる。

【0033】次いで、第1実施形態におけるインシュレータダッシュ10の防音メカニズムについて、図2

(b)を基に説明する。すなわち、ダッシュパネル1からの入射音F1は、ベース吸音層30Aで減衰され、吸音材内部音F2となり、更に、補助吸音層30B、表皮層20を通じて車室内側に透過音F3として伝播される。

【0034】また、車室内側からの放射音F4は、表皮層20を通じて再度、吸音層30A、30B内に吸音され、反射音F5は非常に小さいものとなる。従って、室内音Fは、 $F = F3 + F5$ であり、ベース吸音層30Aと表皮層20との間に柔らかい材料の補助吸音層30Bを介装することで、表皮層20の振動を減衰させ、及びベース吸音層30Aから表皮層20への振動伝達を減少させることになり、結果的に反射音F5を小さく制御でき、低・中周波数域の反射音を減少させることができる。

【0035】次に、図3は、本発明の第2実施形態を示すもので、この第2実施形態におけるインシュレータダッシュ10は、表皮層20と、2層の吸音層30A、30Cとから構成されており、多孔質吸音機能を有するベース吸音層30Aとダッシュパネル1との間に面密度、バネ定数が小さく、かつ薄肉の補助吸音層30Cを介装した構成である。

【0036】従って、ダッシュパネル1から透過した騒音のうち、特に低域振動を補助吸音層30Cにより軽減させることができるため、低周波数域の騒音に対する吸

音性能を向上させることができる。

【0037】更に、第2実施形態におけるインシュレータダッシュ10の防音メカニズムについて、図3(b)を基に説明する。すなわち、ダッシュパネル1からの入射音F1は、補助吸音層30C、ベース吸音層30Aで減衰され、吸音材内部音F2となる。そして、表皮層20を通じて車室内側に透過音F3として伝播される。

【0038】このとき、ダッシュパネル1とベース吸音層30Aへの振動伝達を小さくでき、吸音材内部音F2を小さく制御できる。また、車室内側からの放射音F4は、表皮層20を通して再度ベース吸音層30Aに吸音され、一部は反射音F5として室内に反射される。

【0039】従って、室内音Fは $F = F3 + F5$ であり、吸音材内部音F2を抑えることができるため、透過音F3を小さくでき、特に、低周波数域の振動を有効に減衰させることができる。

【0040】次いで、図4に示すように、第3実施形態におけるインシュレータダッシュ10は、ベースとなる吸音層30Aの両面にそれぞれベース吸音層30Aより面密度、バネ定数が小さく、かつ厚みの薄い2層の補助吸音層30B、30Cを積層した3層構造の吸音層30A、30B、30Cを使用した構成である。

【0041】従って、第3実施形態におけるインシュレータダッシュ10においては、ベース吸音層30Aの表皮層20と接する面側に面密度、バネ定数の小さい補助吸音層30Bを積層することで、表皮層20のもつ吸音性能をより発揮させることができるとともに、ベース吸音層30Aのダッシュパネル1と接する面側に面密度、バネ定数の小さい補助吸音層30Cを介装することで、ダッシュパネル1からの特に低周波数域の振動を抑えることができるため、透過音F3と反射音F5の双方を小さくできることから吸音性能をより高めることができる。

【0042】また、以上説明した第1実施形態乃至第3実施形態の構成は、いずれもダッシュパネル1に添装されるインシュレータダッシュ10に適用したものであるが、エンジンルーム内に設けられる防音材や、トランクルーム、ラゲージルーム内に設けられる防音材、あるいはフロアカーペットに適用することもできる。

【0043】

【発明の効果】以上説明した通り、本発明に係る車両用防音材は、表皮層として、従来の重量の嵩む遮音層に替えて、発泡材表皮、フィルム材表皮、あるいは繊維集合体を材料としたため、防音材の軽量化を図ることができ、燃費効率の向上及び車体パネルへの取付作業性を高めることができるという効果を有する。

【0044】更に、本発明に係る車両用防音材は、表皮層として発泡材表皮、フィルム材表皮、あるいは繊維集合体からなる表皮を使用したため、非通気状態、あるいは通気性がほとんどない状態にして、膜振動吸音機能、

あるいは共振吸音機能を達成することができるとともに、通気性を備え、かつ通気性を増大させることにより、多孔質吸音機能をもたせることができるため、低周波数域から高周波数域のあらゆるレベルの騒音を有効に吸音できるという効果を有する。

【0045】加えて、本発明に係る車両用防音材は、吸音層として、多孔質機能をもつベース吸音層の一面、あるいは両面にベース吸音層より面密度、バネ定数が小さく、かつ厚みの薄い補助吸音層を付設した多層構造の吸音層を使用したため、表皮層が備える膜振動吸音機能、共振吸音機能をより有効に作用させることができるとともに、車体パネルから透過する低周波数域の騒音をより有効に吸音できるという効果を有する。

【図面の簡単な説明】

【図1】本発明に係る車両用防音材をインシュレータダッシュに適用した第1実施形態を示す全体図である。

【図2】(a)図1に示すインシュレータダッシュの要部断面図、(b)同インシュレータダッシュの防音メカニズムを示す説明図である。

【図3】(a)本発明に係る車両用防音材をインシュレータダッシュに適用した第2実施形態の概略構成を示す要部断面図、(b)同インシュレータダッシュの防音メカニズムを示す説明図である。

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*【図4】本発明に係る車両用防音材をインシュレータダッシュに適用した第3実施形態の概略構成を示す要部断面図である。

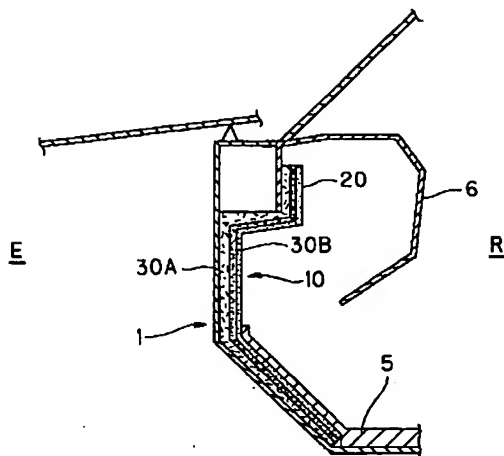
【図5】インシュレータダッシュの設置箇所を示す説明図である。

【図6】従来のインシュレータダッシュの構成を示す全体図である。

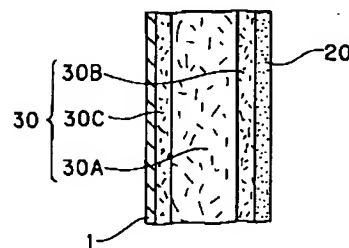
【符号の説明】

- 1 ダッシュパネル
- 5 フロアカーペット
- 6 インストルメントパネル
- 10 インシュレータダッシュ
- 20 表皮層
- 30 吸音層
- 30A ベース吸音層
- 30B 補助吸音層
- 30C 補助吸音層
- F 室内音
- F1 入射音
- F2 吸音材内部音
- F3 透過音
- F4 放射音
- F5 反射音

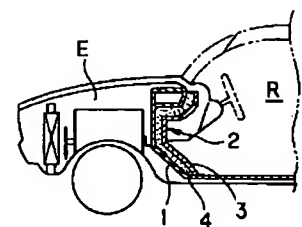
【図1】



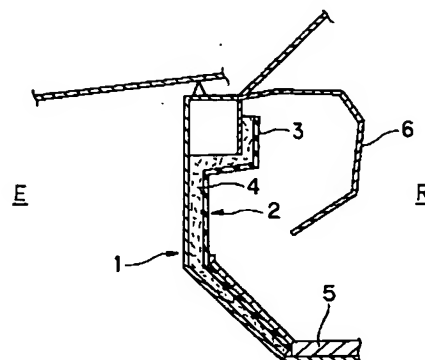
【図4】



【図5】

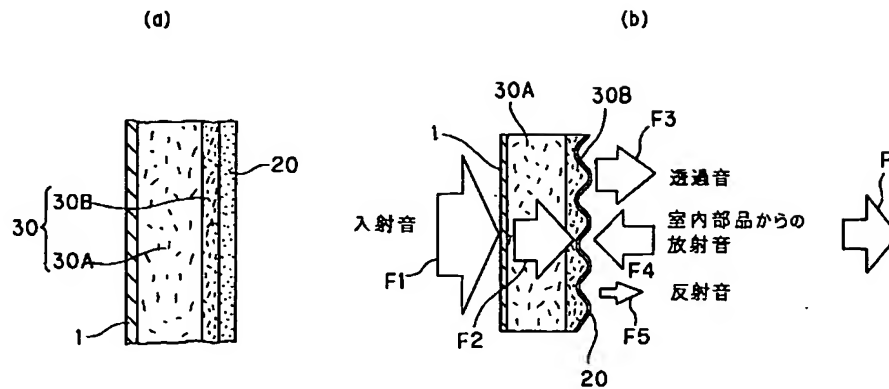


【図6】

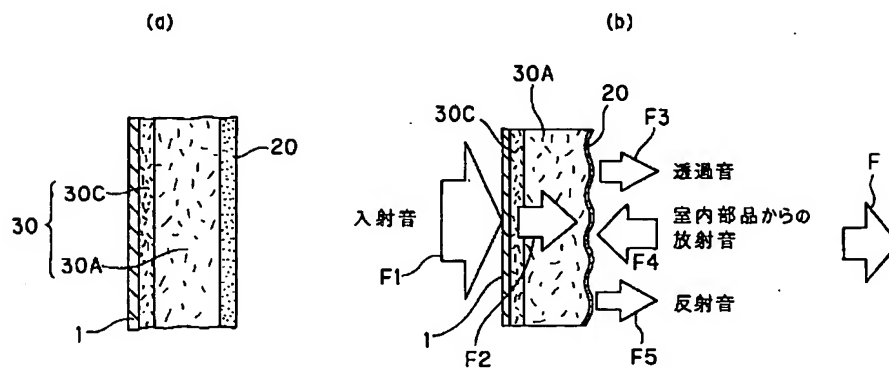


- 1 ダッシュパネル
- 5 フロアカーペット
- 6 インストルメントパネル
- 10 インシュレータダッシュ
- 20 表皮層
- 30 吸音層
- 30A ベース吸音層
- 30B 補助吸音層
- 30C 補助吸音層
- F 室内音
- F1 入射音
- F2 吸音材内部音
- F3 透過音
- F4 放射音
- F5 反射音

【図2】



【図3】



フロントページの続き

F ターム(参考) 3D003 AA04 CA05 DA03 DA10 DA22
 3D023 AD06 BA02 BA03 BB17
 4F100 AK01A AR00B AR00C BA03
 BA07 BA10A BA10C BA26
 DG06A DJ01A GB32 HB00A
 JA13B JA13C JD01A JH01
 JH01B JH01C JK07B JK07C
 5D061 AA22 AA26 BB01 BB21 BB24

2003-21658

CLAIMS

[Claim(s)]

[Claim 1] It is the sound insulating material for cars which is a sound insulating material for cars (10) attached in the indoor side side of a car-body panel (1), and is characterized by this sound insulating material (10) consisting of an epidermis layer (20) which consists of foam, film material, or a fiber aggregate, and two or more absorption-of-sound layers (30) from which it consists of foam or a fiber aggregate, and surface density, a load rate, and thickness differ.

[Claim 2] An absorption-of-sound layer (30) is a sound insulating material for cars according to claim 1 with which it is located between a base absorption-of-sound layer (30A), and this **SU absorption-of-sound layer (30A) and an epidermis layer (20), and surface density and a load rate are characterized by consisting of auxiliary absorption-of-sound layers (30B) of thin meat small from a base absorption-of-sound layer (30A).

[Claim 3] An absorption-of-sound layer (30) is a sound insulating material for cars according to claim 1 or 2 with which it is located between a base absorption-of-sound layer (30A), a base absorption-of-sound layer (30A), and a car-body panel (1), and surface density and a load rate are characterized by consisting of auxiliary absorption-of-sound layers (30C) of thin meat small from the above-mentioned base absorption-of-sound layer (30A).

[Claim 4] An epidermis layer (20) is a sound insulating material for cars according to claim 1 to 3 characterized by to have been able to choose to the condition equipped with high permeability from the non-aeration condition, and having the absorption-of-sound function of the low and the inside frequency region by film vibration, and the absorption-of-sound function of the inside of porosity, and a high-frequency region.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] It relates to the sound insulating material for cars with which the outstanding absorption-of-sound engine performance is obtained while this invention relates to the sound insulating material for

cars attached in the indoor side side of a car-body panel, abolishes the noise insulation layer in which weight increases especially and attains lightweight-ization.

[0002]

[Description of the Prior Art] Usually, in order to raise the silence of the vehicle interior of a room, the various sound insulating materials for cars are prepared.

[0003] In drawing 5 and drawing 6 , an insulator dash is explained as an example of the sound insulating material for cars. As shown in drawing 5 , the indoor side side of the dash panel 1 which divides an engine room E and the vehicle room R is decorated with the insulator dash 2.

[0004] This insulator dash 2 consists of a noise insulation layer 3 which consists of high density ingredients, such as a playback rubber sheet and a playback vinyl chloride sheet, and an absorption-of-sound layer 4 which consists of the fiber aggregate by which laminating unification is carried out at that rear-face side so that it may expand to drawing 6 and may be shown.

[0005] In addition, the floor carpet 5 is laid by the bottom front face of the insulator dash 2 in the shape of a lap, and the upper part side of the insulator dash 2 is located in an instrument panel 6.

[0006] And a part insulates with a dash panel, a part penetrates a dash panel 1 and the sound isolation mechanism of the insulator dash 2 of the conventional two-layer structure spreads the noise of the engines in an engine room E, and **** to an interior-of-a-room side. This propagation noise insulates by the double-wall noise insulation function of the noise insulation layer 3 while that part absorbs sound further by the porosity absorption-of-sound nature of the absorption-of-sound layer 4.

[0007]

[Problem(s) to be Solved by the Invention] Thus, since the conventional insulator dash 2 consists of two-layer layered products of the noise insulation layer 3 made from the high density ingredient, and the absorption-of-sound layer 4 which consists of the fiber aggregate and the weight of the noise insulation layer 3 increases very much especially, it moves against lightweight-ization of a product and the trouble of reducing the attachment workability of decline in fuel consumption effectiveness or the insulator dash 2 is pointed out.

[0008] Furthermore, since it was dependent on the Lord of the insulator dash

2 at noise insulation / absorption-of-sound function by the double-wall noise insulation function, the sound isolation mechanism of the conventional insulator dash 2 had the small absorption-of-sound function within an instrument panel 6, and the frequency region of the noise used as a target was limited, and it was not necessarily able to say that it was effective from a low frequency region to the noise of the broad frequency region in a high-frequency region.

[0009] While this invention was made in view of such a situation, abolishes the noise insulation layer in which it is the sound insulating material for cars attached in the indoor side side of a car-body panel, and weight increases especially and promoting lightweight-ization It aims at offering the sound insulating material for cars which can count upon the absorption-of-sound engine performance which was excellent to the noise in a large frequency region from the level of low and an inside frequency region to the level of inside and a high frequency region.

[0010]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the invention in this application is a sound insulating material for cars attached in the indoor side side of a car-body panel, and it is characterized by this sound insulating material consisting of an epidermis layer which consists of foam, film material, or a fiber aggregate, and two or more absorption-of-sound layers from which it consists of foam or a fiber aggregate, and surface density, a load rate, and thickness differ.

[0011] Here, an epidermis layer consists of matter, such as an olefin system and EPDM, and the quality of the material consists of foam or film material, such as polypropylene, polyurethane, polyethylene, and polyester. Or the fiber aggregate which made felt, PET, and papers (pulp etc.) fibrous can also be used.

[0012] This epidermis layer is 0.005 - 0.3 kg/m² preferably, although surface density is not specified. It is good. Thickness is 10 micrometers - 15mm, is possible also for setting it as the whole surface of an absorption-of-sound layer, or a part, and can also be set as a panel side, a front-face side, or both sides.

[0013] Moreover, while being able to expect the film vibration by foam or film material as the quality of the material of an epidermis layer if permeability is small or it is in a non-aeration condition when foam and film material are

used, when the fiber aggregate is used, the noise of low and an inside frequency region (500-2500Hz) can be effectively absorbed sound according to a resonance operation. Furthermore, if foam or the fiber aggregate is used and permeability is set up comparatively greatly as an epidermis layer, the absorption-of-sound function by porosity will be obtained.

[0014] Subsequently, the quality of the material of an absorption-of-sound layer consists of porosity matter (foam), such as the fiber aggregate which made felt, PET, and papers (pulp etc.) fibrous or an olefin system, and EPDM.

[0015] Furthermore, it is conditions that an absorption-of-sound layer consists of two or more layers from which the surface density more than two-layer, a load rate, and thickness differ at least. While the surface density of a base absorption-of-sound layer is [the thickness of 0.2 - 3.0 kg/m² and a base absorption-of-sound layer] 2-200mm, about an auxiliary absorption-of-sound layer with a small load rate with thin and thickness, surface density is 0.5 kg/m² to a base absorption-of-sound layer. It is the following and the range of thickness of 1-30mm is good.

[0016] Moreover, the small auxiliary absorption-of-sound layer of a load rate can be set as any of the epidermis layer side face of a base absorption-of-sound layer, or a panel side face, one side, or both sides. Furthermore, the average of the normal incidence sound absorption coefficient concerning this invention is 30 - 90% (thickness o'clock of 20mm) in the range of 630-4000Hz.

[0017] And since according to the sound insulating material for cars concerning the invention in this application the noise insulation layer in which the conventional weight increases as an epidermis layer is abolished and the fiber aggregate or foam, and film material are used, lightweight-ization of a product can be promoted. Moreover, if a non-aeration condition or permeability is made small for an epidermis layer, the noise of the whole region, especially a low and an inside frequency region can be effectively absorbed sound according to film vibration or a resonance operation of an epidermis layer.

[0018] Furthermore, an absorption-of-sound layer and an interval can absorb sound the noise of inside and a high-frequency region effectively by the porosity absorption-of-sound function by making the permeability of an epidermis layer increase.

[0019] In addition, since it is the configuration that an absorption-of-sound

layer consists of two or more layers, and thickness is thin and prepares an auxiliary absorption-of-sound layer with small surface density and load rate in both sides of a base absorption-of-sound layer, or one side rather than it to a base absorption-of-sound layer, If an auxiliary absorption-of-sound layer is prepared between a base absorption-of-sound layer and an epidermis layer, the film absorption-of-sound function as an epidermis layer and a resonance absorption-of-sound function can be raised more, and the noise of low and an inside frequency region can be absorbed sound more effectively.

[0020] Furthermore, if the small auxiliary absorption-of-sound layer of a load rate is set to a panel side side, vibration of the low and the inside frequency region from a panel can be made to mitigate.

[0021]

[Embodiment of the Invention] Hereafter, the example applied to the insulator dash is explained to a detail as an operation gestalt of the sound insulating material for cars concerning this invention, referring to an accompanying drawing.

[0022] The general drawing showing the 1st operation gestalt which applied the sound insulating material for cars which drawing 1 requires for this invention to the insulator dash, the schematic diagram in which drawing 2 shows the configuration of this insulator dash, drawing 3 , and drawing 4 are the explanatory views showing the laminating configuration of the 2nd operation gestalt and the 3rd operation gestalt which applied the sound insulating material for cars concerning this invention to the insulator dash.

[0023] The 1st operation gestalt of this invention is explained based on drawing 1 and drawing 2 . In drawing 1 , the indoor side side of the dash panel 1 which divides an engine room E and the vehicle room R is decorated with the insulator dash 10, the floor carpet 5 is laid by the bottom front face of the insulator dash 10 in the shape of a lap, and the Johan part of the insulator dash 10 is further located in an instrument panel 6. In addition, the instrument panel 6 is equipped with the crash putt which is not illustrated.

[0024] By the way, even if it lightweight-izes, the insulator dash 10 which applied this invention is constituted so that sufficient sound isolation property and the especially good absorption-of-sound engine performance may be maintained, while lightweight-izing product weight sharply, in order to raise fuel consumption effectiveness and attachment workability.

[0025] That is, it is the description that the insulator dash 10 consists of a lightweight-ized epidermis layer 20 and an absorption-of-sound layer 30 (set to base absorption-of-sound layer 30A which consists of porosity material used as *-SU from two or more layers of the auxiliary absorption-of-sound layers 30B and 30C by which a laminating is carried out to those both sides or one side).

[0026] And the laminating of the epidermis layer 20, auxiliary absorption-of-sound layer 30B, and the base absorption-of-sound layer 30A is carried out one by one from a product front-face side, and the insulator dash 10 which applied the 1st operation gestalt of this invention is constituted.

[0027] Furthermore, in detail, the epidermis layer 20 is changed to the noise insulation layer in which the conventional weight increases, and the lightweight material is being used for it. For example, it can consist of matter, such as an olefin system and EPDM, and the fiber aggregate which made felt, PET fiber, and papers (pulp etc.) fibrous as the quality of the material, using foam, such as polypropylene, polyurethane, polyethylene, and polyester, or film material can also be used. Especially as surface density, although a numeric value is not limited, it is 0.005 - 0.3 kg/m² as range of desirable surface density. It is good and thickness is set to a maximum of 15mm. Like this operation gestalt, although you may prepare all over the absorption-of-sound layer 30, it is also possible to apply only to the part and to set it as both sides of the absorption-of-sound layer 30.

[0028] Subsequently, in order that porous matter (foam), such as felt, PET, a fiber aggregate that made papers (pulp etc.) fibrous or an olefin system, and EPDM, can be used for the quality of the material of the absorption-of-sound layer 30 and base absorption-of-sound layer 30A may obtain a porosity absorption-of-sound function, 0.2 - 3.0 kg/m² and thickness are set as the range of 2-200mm for the surface density.

[0029] On the other hand, auxiliary absorption-of-sound layer 30B attached to base absorption-of-sound layer 30A has surface density and a load rate smaller than base absorption-of-sound layer 30A, and surface density is 0.5 kg/m². It is the following and the range of 1-30mm is suitable for thickness.

[0030] And the insulator dash 10 shown in drawing 1 and drawing 2 can control the desired absorption-of-sound engine performance by changing various aeration properties of the epidermis layer 20 especially while being able to make product weight light and attaining improvement in workability

and fuel consumption effectiveness, since the light-weight material was used as an epidermis layer 20.

[0031] In the case where a non-aeration condition or permeability is small While being able to absorb sound effectively the noise of low and an inside frequency region (500-2500Hz) by film vibration of the epidermis layer 20 or resonance nature By having permeability as an epidermis layer 20, and making permeability increase, a porosity absorption-of-sound function is obtained and tuning of the frequency region of the noise of an aim -- the noise of inside and a high-frequency region (800-4000Hz) can be absorbed sound effectively -- is attained. Therefore, since frequencies to carry out improvement in the engine performance by the vehicle differ, according to the frequency used as the aim of the vehicle, it becomes possible to change sound absorption characteristics suitably.

[0032] Furthermore, by considering as the absorption-of-sound layer 30 of the two-layer structure with which surface density and a load rate were small between base absorption-of-sound layer 30A and the epidermis layer 20, and prepared auxiliary absorption-of-sound layer 30B of thin meat in it as an absorption-of-sound layer 30, since the film absorption-of-sound function or resonance absorption-of-sound function of the epidermis layer 20 acts effectively especially, the absorption-of-sound engine performance which the epidermis layer 20 has can be raised more.

[0033] Subsequently, the sound isolation mechanism of the insulator dash 10 in the 1st operation gestalt is explained based on drawing 2 (b). That is, the incidence sound F1 from a dash panel 1 is decreased by base absorption-of-sound layer 30A, turns into the interior sound F2 of acoustic material, and is further spread as a transmitted sound F3 to a vehicle interior-of-a-room side through auxiliary absorption-of-sound layer 30B and the epidermis layer 20.

[0034] Moreover, the radiation sound F4 from a vehicle interior-of-a-room side absorbs sound in absorption-of-sound layer 30A and 30B again through the epidermis layer 20, and a reflected sound F5 will become very small. Therefore, the indoor sound F is $F=F3+F5$ and it is infixing auxiliary absorption-of-sound layer 30B of a soft ingredient between base absorption-of-sound layer 30A and the epidermis layer 20. Attenuate vibration of the epidermis layer 20 and the oscillating transfer in the epidermis layer 20 from base absorption-of-sound layer 30A is made to decrease, a reflected sound F5 can be controlled small as a result, and the reflected sound of low and an inside frequency region can be decreased.

[0035] Next, drawing 3 shows the 2nd operation gestalt of this invention, the insulator

dash 10 in this 2nd operation gestalt consists of an epidermis layer 20 and two-layer absorption-of-sound layers 30A and 30C, and it is the configuration that surface density and a load rate were small between base absorption-of-sound layer 30A and the dash panels 1 which have a porosity absorption-of-sound function, and infixed auxiliary absorption-of-sound layer 30C of thin meat in it.

[0036] Therefore, since especially low-pass vibration can be made to mitigate by auxiliary absorption-of-sound layer 30C among the noise penetrated from the dash panel 1, the absorption-of-sound engine performance to the noise of a low frequency region can be raised.

[0037] Furthermore, the sound isolation mechanism of the insulator dash 10 in the 2nd operation gestalt is explained based on drawing 3 (b). That is, the incidence sound F1 from a dash panel 1 is decreased by auxiliary absorption-of-sound layer 30C and base absorption-of-sound layer 30A, and turns into the interior sound F2 of acoustic material. And it is spread as a transmitted sound F3 to a vehicle interior-of-a-room side through the epidermis layer 20.

[0038] At this time, the oscillating transfer to a dash panel 1 and base absorption-of-sound layer 30A can be made small, and the interior sound F2 of acoustic material can be controlled small. Moreover, the radiation sound F4 from a vehicle interior-of-a-room side absorbs sound to base absorption-of-sound layer 30A again through the epidermis layer 20, and a part is indoors reflected as a reflected sound F5.

[0039] Therefore, the indoor sound F is $F = F3 + F5$, since it can stop the interior sound F2 of acoustic material, can make a transmitted sound F3 small, and can attenuate vibration of a low frequency region effectively especially.

[0040] Subsequently, as shown in drawing 4, the insulator dash 10 in the 3rd operation gestalt is the configuration which used the absorption-of-sound layers 30A, 30B, and 30C of the three-tiered structure to which surface density and a load rate carried out the laminating of the two-layer auxiliary absorption-of-sound layers 30B and 30C with thin thickness small from base absorption-of-sound layer 30A, respectively for both sides of absorption-of-sound layer 30A used as the base.

[0041] Therefore, it sets on the insulator dash 10 in the 3rd operation gestalt. By carrying out the laminating of the small auxiliary absorption-of-sound layer 30B of surface density and a load rate to the field side which touches the epidermis layer 20 of base absorption-of-sound layer 30A While being able to demonstrate more the absorption-of-sound engine performance which the epidermis layer 20 has By infixing surface density and small auxiliary absorption-of-sound layer 30C of a load rate in the field side which touches the dash panel 1 of base absorption-of-sound layer 30A Since

vibration of a low frequency region can be suppressed especially from the dash panel 1, and the both sides of a transmitted sound F3 and a reflected sound F5 can be made small, the absorption-of-sound engine performance can be raised more.

[0042] Moreover, although each configuration of the 1st operation gestalt explained above thru/or the 3rd operation gestalt is applied to the insulator dash 10 with which a dash panel 1 is decorated, it is also applicable to the sound insulating material prepared in an engine room, the sound insulating material prepared in a trunk room and a luggage room, or a floor carpet.

[0043] [Effect of the Invention] The sound insulating material for cars concerning this invention can be changed to the noise insulation layer in which the conventional weight increases as an epidermis layer, foam epidermis, film material epidermis, or the fiber aggregate can be written as an ingredient, lightweight-ization of a sound insulating material can be attained, and it has the effectiveness that the improvement in fuel consumption effectiveness and the attachment workability to a car-body panel can be raised as explained above.

[0044] Furthermore, since foam epidermis, film material epidermis, or the epidermis that consists of the fiber aggregate was used for the sound insulating material for cars concerning this invention as an epidermis layer, While being able to change into a non-aeration condition or the condition that there is almost no permeability and being able to attain a film oscillating absorption-of-sound function or a resonance absorption-of-sound function Since a porosity absorption-of-sound function can be given by having permeability and increasing permeability, it has the effectiveness that the noise of all the level of a low frequency region to a high frequency region can be absorbed sound effectively.

[0045] In addition, the whole surface of the base absorption-of-sound layer in which the sound insulating material for cars concerning this invention has a porosity function as an absorption-of-sound layer, Or since the absorption-of-sound layer of the multilayer structure by which surface density and a load rate attached the small and thin auxiliary absorption-of-sound layer of thickness to both sides from the base absorption-of-sound layer was used, While being able to make the film oscillating absorption-of-sound function and resonance absorption-of-sound function with which an epidermis layer is equipped act more effectively, it has the effectiveness that the noise of the low frequency region penetrated from a car-body panel can be absorbed sound more effectively.

TECHNICAL FIELD

[Field of the Invention] It relates to the sound insulating material for cars with which the outstanding absorption-of-sound engine performance is obtained while this invention relates to the sound insulating material for cars attached in the indoor side side of a car-body panel, abolishes the noise insulation layer in which weight increases especially and attains lightweight-ization.

PRIOR ART

[Description of the Prior Art] Usually, in order to raise the silence of the vehicle interior of a room, the various sound insulating materials for cars are prepared.

[0003] In drawing 5 and drawing 6 , an insulator dash is explained as an example of the sound insulating material for cars. As shown in drawing 5 , the indoor side side of the dash panel 1 which divides an engine room E and the vehicle room R is decorated with the insulator dash 2.

[0004] This insulator dash 2 consists of a noise insulation layer 3 which consists of high density ingredients, such as a playback rubber sheet and a playback vinyl chloride sheet, and an absorption-of-sound layer 4 which consists of the fiber aggregate by which laminating unification is carried out at that rear-face side so that it may expand to drawing 6 and may be shown.

[0005] In addition, the floor carpet 5 is laid by the bottom front face of the insulator dash 2 in the shape of a lap, and the upper part side of the insulator dash 2 is located in an instrument panel 6.

[0006] And a part insulates with a dash panel, a part penetrates a dash panel 1 and the sound isolation mechanism of the insulator dash 2 of the conventional two-layer structure spreads the noise of the engines in an engine room E, and **** to an interior-of-a-room side. This propagation noise insulates by the double-wall noise insulation function of the noise insulation layer 3 while that part absorbs sound further by the porosity absorption-of-sound nature of the absorption-of-sound layer 4.

EFFECT OF THE INVENTION

[Effect of the Invention] The sound insulating material for cars concerning this invention can be changed to the noise insulation layer in which the

conventional weight increases as an epidermis layer, foam epidermis, film material epidermis, or the fiber aggregate can be written as an ingredient, lightweight-ization of a sound insulating material can be attained, and it has the effectiveness that the improvement in fuel consumption effectiveness and the attachment workability to a car-body panel can be raised as explained above.

[0044] Furthermore, since foam epidermis, film material epidermis, or the epidermis that consists of the fiber aggregate was used for the sound insulating material for cars concerning this invention as an epidermis layer, While being able to change into a non-aeration condition or the condition that there is almost no permeability and being able to attain a film oscillating absorption-of-sound function or a resonance absorption-of-sound function Since a porosity absorption-of-sound function can be given by having permeability and increasing permeability, it has the effectiveness that the noise of all the level of a low frequency region to a high frequency region can be absorbed sound effectively.

[0045] In addition, the whole surface of the base absorption-of-sound layer in which the sound insulating material for cars concerning this invention has a porosity function as an absorption-of-sound layer, Or since the absorption-of-sound layer of the multilayer structure by which surface density and a load rate attached the small and thin auxiliary absorption-of-sound layer of thickness to both sides from the base absorption-of-sound layer was used, While being able to make the film oscillating absorption-of-sound function and resonance absorption-of-sound function with which an epidermis layer is equipped act more effectively, it has the effectiveness that the noise of the low frequency region penetrated from a car-body panel can be absorbed sound more effectively.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Thus, since the conventional insulator dash 2 consists of two-layer layered products of the noise insulation layer 3 made from the high density ingredient, and the absorption-of-sound layer 4 which consists of the fiber aggregate and the weight of the noise insulation layer 3 increases very much especially, it moves against lightweight-ization of a product and the trouble of reducing the attachment workability of decline in fuel consumption effectiveness or the insulator dash

2 is pointed out.

[0008] Furthermore, since it was dependent on the Lord of the insulator dash 2 at noise insulation / absorption-of-sound function by the double-wall noise insulation function, the sound isolation mechanism of the conventional insulator dash 2 had the small absorption-of-sound function within an instrument panel 6, and the frequency region of the noise used as a target was limited, and it was not necessarily able to say that it was effective from a low frequency region to the noise of the broad frequency region in a high-frequency region.

[0009] While this invention was made in view of such a situation, abolishes the noise insulation layer in which it is the sound insulating material for cars attached in the indoor side side of a car-body panel, and weight increases especially and promoting lightweight-ization It aims at offering the sound insulating material for cars which can count upon the absorption-of-sound engine performance which was excellent to the noise in a large frequency region from the level of low and an inside frequency region to the level of inside and a high frequency region.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the invention in this application is a sound insulating material for cars attached in the indoor side side of a car-body panel, and it is characterized by this sound insulating material consisting of an epidermis layer which consists of foam, film material, or a fiber aggregate, and two or more absorption-of-sound layers from which it consists of foam or a fiber aggregate, and surface density, a load rate, and thickness differ.

[0011] Here, an epidermis layer consists of matter, such as an olefin system and EPDM, and the quality of the material consists of foam or film material, such as polypropylene, polyurethane, polyethylene, and polyester. Or the fiber aggregate which made felt, PET, and papers (pulp etc.) fibrous can also be used.

[0012] This epidermis layer is 0.005 - 0.3 kg/m² preferably, although surface density is not specified. It is good. Thickness is 10 micrometers - 15mm, is possible also for setting it as the whole surface of an absorption-of-sound layer, or a part, and can also be set as a panel side, a front-face side, or both

sides.

[0013] Moreover, while being able to expect the film vibration by foam or film material as the quality of the material of an epidermis layer if permeability is small or it is in a non-aeration condition when foam and film material are used, when the fiber aggregate is used, the noise of low and an inside frequency region (500-2500Hz) can be effectively absorbed sound according to a resonance operation. Furthermore, if foam or the fiber aggregate is used and permeability is set up comparatively greatly as an epidermis layer, the absorption-of-sound function by porosity will be obtained.

[0014] Subsequently, the quality of the material of an absorption-of-sound layer consists of porosity matter (foam), such as the fiber aggregate which made felt, PET, and papers (pulp etc.) fibrous or an olefin system, and EPDM.

[0015] Furthermore, it is conditions that an absorption-of-sound layer consists of two or more layers from which the surface density more than two-layer, a load rate, and thickness differ at least. While the surface density of a base absorption-of-sound layer is [the thickness of 0.2 - 3.0 kg/m² and a base absorption-of-sound layer] 2-200mm, about an auxiliary absorption-of-sound layer with a small load rate with thin and thickness, surface density is 0.5 kg/m² to a base absorption-of-sound layer. It is the following and the range of thickness of 1-30mm is good.

[0016] Moreover, the small auxiliary absorption-of-sound layer of a load rate can be set as any of the epidermis layer side face of a base absorption-of-sound layer, or a panel side face, one side, or both sides. Furthermore, the average of the normal incidence sound absorption coefficient concerning this invention is 30 - 90% (thickness o'clock of 20mm) in the range of 630-4000Hz.

[0017] And since according to the sound insulating material for cars concerning the invention in this application the noise insulation layer in which the conventional weight increases as an epidermis layer is abolished and the fiber aggregate or foam, and film material are used, lightweight-ization of a product can be promoted. Moreover, if a non-aeration condition or permeability is made small for an epidermis layer, the noise of the whole region, especially a low and an inside frequency region can be effectively absorbed sound according to film vibration or a resonance operation of an epidermis layer.

[0018] Furthermore, an absorption-of-sound layer and an interval can absorb

sound the noise of inside and a high-frequency region effectively by the porosity absorption-of-sound function by making the permeability of an epidermis layer increase.

[0019] In addition, since it is the configuration that an absorption-of-sound layer consists of two or more layers, and thickness is thin and prepares an auxiliary absorption-of-sound layer with small surface density and load rate in both sides of a base absorption-of-sound layer, or one side rather than it to a base absorption-of-sound layer, If an auxiliary absorption-of-sound layer is prepared between a base absorption-of-sound layer and an epidermis layer, the film absorption-of-sound function as an epidermis layer and a resonance absorption-of-sound function can be raised more, and the noise of low and an inside frequency region can be absorbed sound more effectively.

[0020] Furthermore, if the small auxiliary absorption-of-sound layer of a load rate is set to a panel side side, vibration of the low and the inside frequency region from a panel can be made to mitigate.

[0021]

[Embodiment of the Invention] Hereafter, the example applied to the insulator dash is explained to a detail as an operation gestalt of the sound insulating material for cars concerning this invention, referring to an accompanying drawing.

[0022] The general drawing showing the 1st operation gestalt which applied the sound insulating material for cars which drawing 1 requires for this invention to the insulator dash, the schematic diagram in which drawing 2 shows the configuration of this insulator dash, drawing 3 , and drawing 4 are the explanatory views showing the laminating configuration of the 2nd operation gestalt and the 3rd operation gestalt which applied the sound insulating material for cars concerning this invention to the insulator dash.

[0023] The 1st operation gestalt of this invention is explained based on drawing 1 and drawing 2 . In drawing 1 , the indoor side side of the dash panel 1 which divides an engine room E and the vehicle room R is decorated with the insulator dash 10, the floor carpet 5 is laid by the bottom front face of the insulator dash 10 in the shape of a lap, and the Johan part of the insulator dash 10 is further located in an instrument panel 6. In addition, the instrument panel 6 is equipped with the crash putt which is not illustrated.

[0024] By the way, even if it lightweight-izes, the insulator dash 10 which

applied this invention is constituted so that sufficient sound isolation property and the especially good absorption-of-sound engine performance may be maintained, while lightweight-izing product weight sharply, in order to raise fuel consumption effectiveness and attachment workability.

[0025] That is, it is the description that the insulator dash 10 consists of a lightweight-ized epidermis layer 20 and an absorption-of-sound layer 30 (set to base absorption-of-sound layer 30A which consists of porosity material used as *-SU from two or more layers of the auxiliary absorption-of-sound layers 30B and 30C by which a laminating is carried out to those both sides or one side).

[0026] And the laminating of the epidermis layer 20, auxiliary absorption-of-sound layer 30B, and the base absorption-of-sound layer 30A is carried out one by one from a product front-face side, and the insulator dash 10 which applied the 1st operation gestalt of this invention is constituted.

[0027] Furthermore, in detail, the epidermis layer 20 is changed to the noise insulation layer in which the conventional weight increases, and the lightweight material is being used for it. For example, it can consist of matter, such as an olefin system and EPDM, and the fiber aggregate which made felt, PET fiber, and papers (pulp etc.) fibrous as the quality of the material, using foam, such as polypropylene, polyurethane, polyethylene, and polyester, or film material can also be used. Especially as surface density, although a numeric value is not limited, it is 0.005 - 0.3 kg/m² as range of desirable surface density. It is good and thickness is set to a maximum of 15mm. Like this operation gestalt, although you may prepare all over the absorption-of-sound layer 30, it is also possible to apply only to the part and to set it as both sides of the absorption-of-sound layer 30.

[0028] Subsequently, in order that porous matter (foam), such as felt, PET, a fiber aggregate that made papers (pulp etc.) fibrous or an olefin system, and EPDM, can be used for the quality of the material of the absorption-of-sound layer 30 and base absorption-of-sound layer 30A may obtain a porosity absorption-of-sound function, 0.2 - 3.0 kg/m² and thickness are set as the range of 2-200mm for the surface density.

[0029] On the other hand, auxiliary absorption-of-sound layer 30B attached to base absorption-of-sound layer 30A has surface density and a load rate smaller than base absorption-of-sound layer 30A, and surface density is 0.5 kg/m². It is the following and the range of 1-30mm is suitable for thickness.

[0030] And the insulator dash 10 shown in drawing 1 and drawing 2 can control the desired absorption-of-sound engine performance by changing various aeration properties of the epidermis layer 20 especially while being able to make product weight light and attaining improvement in workability and fuel consumption effectiveness, since the light-weight material was used as an epidermis layer 20.

[0031] In the case where a non-aeration condition or permeability is small While being able to absorb sound effectively the noise of low and an inside frequency region (500-2500Hz) by film vibration of the epidermis layer 20 or resonance nature By having permeability as an epidermis layer 20, and making permeability increase, a porosity absorption-of-sound function is obtained and tuning of the frequency region of the noise of an aim -- the noise of inside and a high-frequency region (800-4000Hz) can be absorbed sound effectively -- is attained. Therefore, since frequencies to carry out improvement in the engine performance by the vehicle differ, according to the frequency used as the aim of the vehicle, it becomes possible to change sound absorption characteristics suitably.

[0032] Furthermore, by considering as the absorption-of-sound layer 30 of the two-layer structure with which surface density and a load rate were small between base absorption-of-sound layer 30A and the epidermis layer 20, and prepared auxiliary absorption-of-sound layer 30B of thin meat in it as an absorption-of-sound layer 30, since the film absorption-of-sound function or resonance absorption-of-sound function of the epidermis layer 20 acts effectively especially, the absorption-of-sound engine performance which the epidermis layer 20 has can be raised more.

[0033] Subsequently, the sound isolation mechanism of the insulator dash 10 in the 1st operation gestalt is explained based on drawing 2 (b). That is, the incidence sound F1 from a dash panel 1 is decreased by base absorption-of-sound layer 30A, turns into the interior sound F2 of acoustic material, and is further spread as a transmitted sound F3 to a vehicle interior-of-a-room side through auxiliary absorption-of-sound layer 30B and the epidermis layer 20.

[0034] Moreover, the radiation sound F4 from a vehicle interior-of-a-room side absorbs sound in absorption-of-sound layer 30A and 30B again through the epidermis layer 20, and a reflected sound F5 will become very small. Therefore, the indoor sound F is $F=F3+F5$ and it is infixing auxiliary

absorption-of-sound layer 30B of a soft ingredient between base absorption-of-sound layer 30A and the epidermis layer 20. Attenuate vibration of the epidermis layer 20 and the oscillating transfer in the epidermis layer 20 from base absorption-of-sound layer 30A is made to decrease, a reflected sound F5 can be controlled small as a result, and the reflected sound of low and an inside frequency region can be decreased.

[0035] Next, drawing 3 shows the 2nd operation gestalt of this invention, the insulator dash 10 in this 2nd operation gestalt consists of an epidermis layer 20 and two-layer absorption-of-sound layers 30A and 30C, and it is the configuration that surface density and a load rate were small between base absorption-of-sound layer 30A and the dash panels 1 which have a porosity absorption-of-sound function, and infixed auxiliary absorption-of-sound layer 30C of thin meat in it.

[0036] Therefore, since especially low-pass vibration can be made to mitigate by auxiliary absorption-of-sound layer 30C among the noise penetrated from the dash panel 1, the absorption-of-sound engine performance to the noise of a low frequency region can be raised.

[0037] Furthermore, the sound isolation mechanism of the insulator dash 10 in the 2nd operation gestalt is explained based on drawing 3 (b). That is, the incidence sound F1 from a dash panel 1 is decreased by auxiliary absorption-of-sound layer 30C and base absorption-of-sound layer 30A, and turns into the interior sound F2 of acoustic material. And it is spread as a transmitted sound F3 to a vehicle interior-of-a-room side through the epidermis layer 20.

[0038] At this time, the oscillating transfer to a dash panel 1 and base absorption-of-sound layer 30A can be made small, and the interior sound F2 of acoustic material can be controlled small. Moreover, the radiation sound F4 from a vehicle interior-of-a-room side absorbs sound to base absorption-of-sound layer 30A again through the epidermis layer 20, and a part is indoors reflected as a reflected sound F5.

[0039] Therefore, the indoor sound F is $F=F3+F5$, since it can stop the interior sound F2 of acoustic material, can make a transmitted sound F3 small, and can attenuate vibration of a low frequency region effectively especially.

[0040] Subsequently, as shown in drawing 4, the insulator dash 10 in the 3rd operation gestalt is the configuration which used the absorption-of-sound

layers 30A, 30B, and 30C of the three-tiered structure to which surface density and a load rate carried out the laminating of the two-layer auxiliary absorption-of-sound layers 30B and 30C with thin thickness small from base absorption-of-sound layer 30A, respectively for both sides of absorption-of-sound layer 30A used as the base.

[0041] Therefore, it sets on the insulator dash 10 in the 3rd operation gestalt. By carrying out the laminating of the small auxiliary absorption-of-sound layer 30B of surface density and a load rate to the field side which touches the epidermis layer 20 of base absorption-of-sound layer 30A While being able to demonstrate more the absorption-of-sound engine performance which the epidermis layer 20 has By infixing surface density and small auxiliary absorption-of-sound layer 30C of a load rate in the field side which touches the dash panel 1 of base absorption-of-sound layer 30A Since vibration of a low frequency region can be suppressed especially from the dash panel 1, and the both sides of a transmitted sound F3 and a reflected sound F5 can be made small, the absorption-of-sound engine performance can be raised more.

[0042] Moreover, although each configuration of the 1st operation gestalt explained above thru/or the 3rd operation gestalt is applied to the insulator dash 10 with which a dash panel 1 is decorated, it is also applicable to the sound insulating material prepared in an engine room, the sound insulating material prepared in a trunk room and a luggage room, or a floor carpet.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the general drawing showing the 1st operation gestalt which applied the sound insulating material for cars concerning this invention to the insulator dash.

[Drawing 2] (a) They are the important section sectional view of an insulator dash shown in drawing 1 , and the explanatory view showing the sound isolation mechanism of the (b) said insulator dash.

[Drawing 3] (a) They are the important section sectional view showing the outline configuration of the 2nd operation gestalt which applied the sound insulating material for cars concerning this invention to the insulator dash, and the explanatory view showing the sound isolation mechanism of the (b) said insulator dash.

[Drawing 4] It is the important section sectional view showing the outline configuration of the 3rd operation gestalt which applied the sound insulating material for cars concerning this invention to the insulator dash.

[Drawing 5] It is the explanatory view showing the installation part of an insulator dash.

[Drawing 6] It is the general drawing showing the configuration of the conventional insulator dash.

[Description of Notations]

1 Dash Panel

5 Floor Carpet

6 Instrument Panel

10 Insulator Dash

20 Epidermis Layer

30 Absorption-of-Sound Layer

30A Base absorption-of-sound layer

30B Auxiliary absorption-of-sound layer

30C Auxiliary absorption-of-sound layer

F Indoor sound

F1 Incidence sound

F2 Interior sound of acoustic material

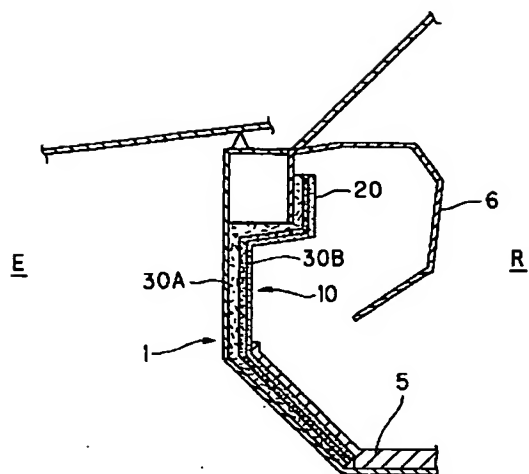
F3 Transmitted sound

F4 Radiation sound

F5 Reflected sound

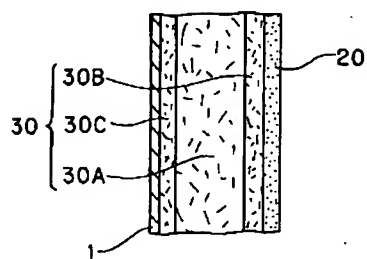
DRAWINGS

[Drawing 1]

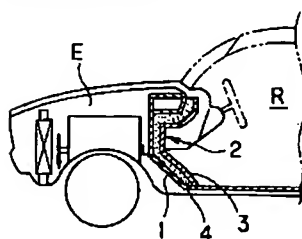


- 1 ダッシュパネル
- 5 フロアカーペット
- 6 インストルメントパネル
- 10 インシュレータダッシュ
- 20 表皮層
- 30 吸音層
- 30A ベース吸音層
- 30B 補助吸音層
- 30C 補助吸音層
- F 室内音
- F1 入射音
- F2 吸音材内部音
- F3 透過音
- F4 放射音
- F5 反射音

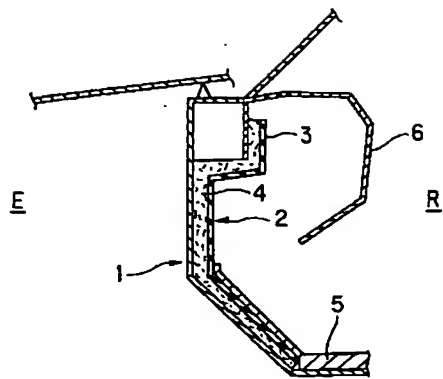
[Drawing 4]



[Drawing 5]



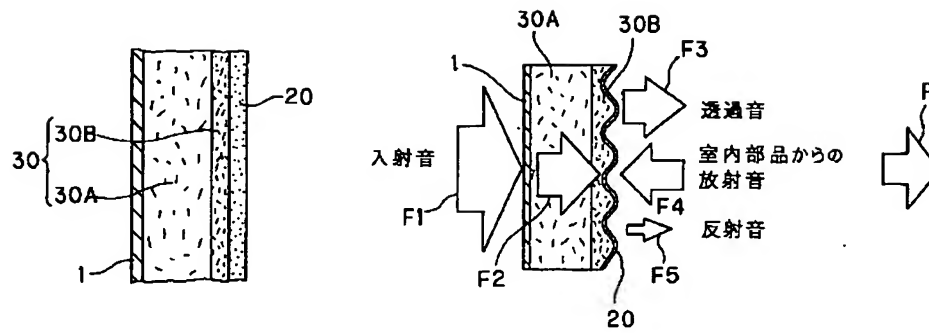
[Drawing 6]



[Drawing 2]

(a)

(b)



[Drawing 3]

(a)

(b)

